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ABSTRACT

This paper reports on a study to see whether girls in middle school who took tests separately from boys did better than when they were tested together. A mathematics attitude and anxiety instrument was administered as part of the study to determine if either had any effect on test performance. Results indicate that boys were more anxious than girls on 16 of 20 anxiety items. No significant gender differences were found in attitude. In the separated test taking part of the survey, girls performed slightly better overall, but differences were not significant. (Contains 23 references.) (MM)

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Boys and Girls Apart

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In the fall we noticed a brief article in the newspaper indicating that girls in middle school who took tests separately from boys scored better than when they were tested together. This was true even though the girls and the boys were together in the instruction part of the class. We decided it would be interesting to see if this would be true with the 7th grade girls at our school. There were 47 students in the 7th grade and 24 in the class we studied - 16 boys and 8 girls. These students were enrolled in an average level mathematics class. The 5 students in the seventh grade whose standardized test scores were at or above the 85th percentile were placed in a higher ability class.

A math attitude and anxiety instrument was administered to the students in an attempt to determine if either had any effect on test performance. Our plan was to have the other average level class take the same tests and compare the scores of the two classes. A month ago we discovered to our dismay that one teacher had not followed through with the original plan, and had not given the same tests as the pilot class nor as many tests. Thus our study will look at only one class.

Gender related differences in mathematics have been a focus of study and concern for a long time. (Adams 1998) A number of studies report that boys and girls do not differ in their self-perceptions in math and science until age 12 - "... At this point girls begin to like math and science less and to like language arts and social studies more than boys." (Gilbert 1996) Hornblower states: "Girls are in trouble. They lose confidence in early adolescence. Their grades plummet, and, following sexual stereotypes, their interest in math and science flags. They are plagued by eating disorders, suffer depression, get pregnant, and attempt suicide. And it all

makes headlines, spawns research projects, and prompts calls for single-sex education." (Hornblower 2000)

Boys, in contrast, are forced into rigid school routines, their rambunctious behavior is considered pathological, and they are diagnosed with attention deficit disorder or hyperactivity. They lose self esteem and lag behind girls in reading and writing. This too makes headlines and spawns research projects and calls for remedial measures. (Hornblower 1998)

Research has suggested that academic performance may be influenced not only by cognitive factors such as ability to represent problems, but also by such non cognitive factors as self perception of ability or academic competence and perceptions of task difficulty. (Montague and Applegate 2000), Fennema and Sherman (1977) and Reyes (1984) reported that males feel more confident about learning mathematics than do females. In addition, the Center for Mathematics Education (1986) posited that the level of confidence among females decreases during the school years, whereas that of males increases. (Adams 2000) Another researcher says that boys are more capable of applying rules and algorithms to unfamiliar situations. (Bracey 1994) Male superiority in the higher order mathematical thinking skills is apparent before adolescence. Benbow and Stanley found that nationwide the ratio of boys to girls scoring at or above 700 on the SAT-M before age 13 - a very rare occurrence - was 13:1. For lower ranges of scores the male superiority is maintained, but at much lower ratios (Benbow and Stanley 1983).

Many have sought reasons for these apparent differences. Some cite the differences between classroom examinations and standardized tests. It is possible that the format of classroom examinations corresponds more to the learning style of girls and that girls tend to be

less successful on standardized tests which use a less familiar format. (Felson and Trudeau 1991) Many researchers attempt to trace the evolution of mathematics anxiety among high school and college students back to their elementary school classroom experiences. Negative classroom experiences in mathematics and lack of support at home combined with an anxiety toward testing will yield a mathematically anxious individual. (Trujillo and Hadfield 2000) Others suggest that parents believe the study of mathematics to be more important for boys than for girls and that this parental belief influences student academic behavior or inherent differences in mathematics self efficacy.

Self-efficacy - an individual's belief of how well he or she can successfully enact behavior required to accomplish some task (O'Brien, Kopala and Martinez-Pons 1999) - is frequently mentioned as playing a role in the differences in mathematical performance of boys and girls. Girls as a group tend to view themselves as less capable than boys in the learning of mathematics, and this attitude is reflected in their performance. (Randhawa, Beamer, and Lundberg 1993).

The site of the study is a coeducational Catholic school offering a college preparatory curriculum for grades 7-12 with a vo-tech option available through the public schools. The school is located in an urban environment with 235 students (71% African-American, 29% White). These students' families are typically in the lower half of the socioeconomic middle class.

We adapted items from a summary of the RMARS (Mathematics Anxiety Rating Scale, revised), MAQ (Mathematics Anxiety Questionnaire), and MAS (Mathematics Anxiety Scale) to generate a survey instrument which was administered to the members of the class (Kazelskis

1998). The students responded on a Likert-like 5 point scale to 20 items concerning math anxiety, 11 items about attitude toward mathematics, and 4 items about worry. Mean scores indicated that the boys were more anxious than the girls on 16 of the 20 anxiety items. In six cases the difference in means was greater than one point:

Question: I get anxious when:	Difference
2. I think about an upcoming math test one hour before	1.375
3. I am being given a "pop" quiz in math	1.063
10. I pick up a math book to begin working on a homework assignment	1.438
17. I walk into a math class	1.063
18. I see a math class on my schedule	1.125
19. I see a new math textbook	1.175

Analyses of variance indicated a significant difference between girls and boys on only two questions which were : "I get anxious when I think about an upcoming math test on hour before," and "I get anxious when I pick up a math book to begin working on a homework assignment." In both cases, boys were more anxious than girls.

On the questions about attitude toward mathematics the only one with a difference in mean of greater than one was question 2: "I get a sinking feeling when I think of trying hard math problems," which the girls claimed to describe them to a greater extent than did the boys. None of the differences were statistically significant, and when we looked at individual questions the responses were hard to interpret. For instance the girls responded that the statement "A math test would scare me" described them somewhat more than it did the boys. But the girls also

responded more positively to " I usually have been at ease during math tests."

The boys and girls gave similar responses to questions about academic worry. They worry a lot about doing well in school, but no more about math than other subjects. Neither was very concerned about missing an occasional assignment.

For the ten tests given during the semester, the boys and girls were separated for testing. Test administration was rotated between the classroom teacher (female) and one of the researchers (male) and the classrooms in which the tests were given were alternated.

On four of these tests, average scores of the boys and girls were essentially the same. The girls' average was 5-10 points higher than that of the boys on five tests and the boys outperformed the girls on one test. The average score on the ten tests for girls was 81 and for boys 77. For this group of average ability 12- and 13-year old students, the performance of girls was slightly better than that of the boys, but again the difference was not statistically significant.

Unfortunately, due to the loss of the other class, our sample was too small and contained too few girls for the differences that were measured to be statistically significant. We did not find that the girls in our sample were more anxious about mathematics or less confident of their ability in mathematics than were the boys, as predicted in the literature - the reverse seemed to be the case. The instruments we used did not specifically measure self-efficacy, but the responses to the items concerning attitude toward mathematics indicated that these girls had as much or more self confidence in this area as the boys.

The tendencies we found seem contrary to expectations based upon our reading, but the sample size was too small to generate statistically significant differences. We plan to continue

administering math tests to boys and girls separately with a greater number of students, and to expand data collection to include administration of the MARS-A (a revised form of MARS that uses items appropriate for adolescents) and the Fennema-Sherman Mathematics Attitude Scales.

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